A21 Sub B2 Cont'd

2. (Amended) The solar cell module according to claim 1, wherein the solar cell element is structured so that light enters from a side opposite of the semiconductor junction.

A22

6. (Amended) The solar cell module according to claim 1, wherein the solar cell element is a single crystalline silicon solar cell element formed by diffusing impurities in the p-type or n-type crystalline silicon substrate with heat diffusion.

A23

8. (Amended) The solar cell module according to claim 1, wherein the solar cell element includes a heterojunction between a crystalline semiconductor and an amorphous semiconductor.

IN THE DRAWINGS:

A Request for Approval of Drawing Corrections, with proposed changes to Figures 3 and 4 highlighted in red is submitted.

REMARKS

The Office Action dated February 12, 2002 has been received and carefully noted. The above amendments to the claims, and the following remarks, are submitted as a full and complete response thereto. By this Amendment, claims 1, 2, 6, and 8 are amended. No new matter is added. The verified translation of Japanese priority document 2000-42638 is submitted herewith. Consideration of claims 1-8 is respectfully requested.

The Office Action objected to Figures 3 and 4 for failing to designate as Prior Art. Applicant submits a Request for Drawing Corrections amending Figures 3 and 4. Accordingly, Applicant requests the withdrawal of the objection to Figures 3 and 4.

The Office Action also objected to the specification citing various informalities. By this amendment, the specification is amended to correct these informalities. No new matter is added. Thus, Applicant respectfully request the withdrawal of the objection to the specification.

The Office Action objected to claims 1, 2, and 8 citing informalities. Claims 1, 2, and 8 are amended to obviate the objection. Therefore, Applicant requests the withdrawal of the objection of claims 1, 2, and 8.

The Office Action rejected claims 1, 2, and 6 under 35 U.S.C. 112, second paragraph, as being indefinite. Claims 1 and 6 have been amended to more particularly point out and distinctly claim the invention. Also, claims 2 and 6 depend from claim 1, therefore, as amended, claims 2 and 6 now recite the present invention more particularly and distinctly. Accordingly, Applicant respectfully requests withdrawal of the rejection of claims 1, 2, and 6. under 35 U.S.C. § 112, second paragraph.

It should be noted that the above amendments do not narrow the scope of the invention and are merely cosmetic in nature. No new matter is added.

Claims 1, 3-5, and 7 are rejected under 35 U.S.C § 102(e) as being anticipated by Yamagishi et al. (U.S. Patent No. 6, 300, 556). The Office Action takes the position that Yamagishi discloses all the elements of the claimed invention. Applicant respectfully submits that Yamagishi neither teaches nor suggests all the limitations of the claimed invention. Accordingly, in view of the following remarks, Applicant requests reconsideration of claims 1, 3-5, and 7.

The essence of the claimed invention, as recited in claim 1, is a solar cell module comprising a solar cell element having a semiconductor junction formed with a p-type or n-type crystalline silicon substrate and n-type or p-type semiconductor layer and the semiconductor junction is positioned at the crystalline silicon substrate on the opposite side of the front surface side light transmitting member. The claimed invention provides the benefit of protecting the solar cell module from moisture. As a result, the claimed invention, provides a solar cell module that reduces the deterioration due to moisture. Thus, it is respectfully submitted that the prior art fails to disclose or suggest the features of the Applicant's invention, and therefore fails to provide the advantages which are provided by the present invention.

Claim 1 is directed to a solar cell module that comprises a front surface side light transmitting member containing at least sodium, a rear surface member, and a solar cell element sealed with sealing resin between the front surface side light transmitting member and the rear surface member. The solar cell element has a semiconductor junction formed

with a p-type or n-type crystalline silicon substrate and n-type or p-type semiconductor layer. The solar cell element has a semiconductor junction positioned at the crystalline silicon substrate on the opposite side of the front surface side light transmitting member.

Yamagishi is directed to a solar cell module that comprises an electrode layer, a semiconductor layer , and a second electrode layer, which are deposited on a substrate at least part of which worked to partition these layers into a plurality of cells which are electrically connected with each other and sealed with an encapsulant. The thin film solar cell module is constructed so that the first electrode layer, a semiconductor layer, and a second electrode layer are deposited on a substrate, and at least part of the these layers is worked by a means of a laser beam to partition the layers into a plurality of cells which are then electrically connected with each other. A transparent substrate, such as a glass substrate, is also disclosed. However, Yamagishi does not teach or suggest all the elements of the claimed invention.

In particular, Yamagishi fails to teach or suggest a solar cell element comprising a crystalline silicon substrate. Also, Yamagishi also fails to teach or suggest a semiconductor junction formed with a p-type or n-type crystalline silicon substrate on an opposite side of the front surface side light transmitting member. Yamagishi, as disclosed in column 7, lines 27-43, teaches a tin film oxide deposited on a glass substrate. In contrast, the claimed invention discloses a crystalline silicon substrate. Thus, it is respectfully submitted that Yamagishi does not teach or suggest the features of the claimed invention. Accordingly, Applicant respectfully requests the withdrawal of the rejection of claim 1.

Claims 3-5, and 7 depend from claim 1, therefore, for at least the reasons mentioned above, claims 3-5 and 7 also recite subject matter which is neither taught nor suggested by the Yamagishi. Thus, Applicant requests the withdrawal of the rejection of claims 3-5 and 7.

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamagishi et al. (U.S. Patent no. 6, 300,556) in view of Matsushita et al. (U.S. Patent No. 6,222,118). The Office Action takes the position that the combination of Yamagishi and Matsushita teaches or suggests all the features of claim 6. Applicant submits that claim 6 recites subject matter that is not disclosed by the applied prior art.

Matsushita is discloses a semiconductor device and manufacturing of that semiconductor device. Matsushita discloses a semiconductor device that comprises a plurality of solar batteries, which are thin film semiconductor layers that are provided with a space in between each of them. The solar batteries have one side and the other side facing each other. The first substrate of both of the solar batteries is extendedly formed on one side, and a second substrate for both is formed on the other side. Each of the solar batteries comprises a reflection-proof film, each provided on one side of each semiconductor layer. Each of the reflection-proof films is formed so that light is prevented from being reflected from the surface. However, the combination of Matsushita and Yamagishi fails to teach or suggest all the elements recited in claim 6.

In particular, Matsushita does cure the deficiencies of Yamagishi. In other words, Matsushita does not teach or suggest the solar cell element having a semiconductor junction formed with a p-type or n-type crystalline substrate and a n-type or p-type semiconductor layer and the solar cell having the semiconductor junction position at the crystalline silicon substrate. Accordingly, Applicant respectfully requests the withdrawal of the rejection of claim 6.

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamagishi et al. (U.S. Patent no. 6, 300, 556) in view of Asano et al. (U.S. Patent No. 5, 456, 764). The Office Action takes the position that the combination of Yamagishi and Asano teach or suggest all the features recited in claim 8. Applicant submits that claim 8 recites subject matter that is neither taught nor suggested by the applied prior art.

Asano discloses a solar cell made using a heterojunction formed from a crystalline silicon layer of a first conductivity type and a hydrogenated amorphous silicon film of a second conductivity type different from the first conductivity type. Thus, a solar cell element having a heterojunction formed with a crystalline silicon layer and an amorphous silicon layer is taught by Asano. However, Asano does not teach or suggest a semiconductor junction formed with a p-type or n-type crystalline silicon substrate and an n-type or p-type semiconductor layer and positioned at the crystalline silicon substrate on the opposite side of the front surface side light transmitting member.

In particular, Asano does not allow for the p-type or n-type to be used in any order rather it only allows an n-type oxygen added hydrogenated amorphous silicon thin film to

be formed on a p-type polycrystalline silicon substrate. In contrast, the claimed invention recites a solar cell element having a semiconductor junction formed with a p-type or n-type crystalline silicon substrate and n-type or p-type semiconductor. Furthermore, Asano does not teach or suggest the semiconductor junction positioned at the crystalline silicon substrate on an opposite side of the front surface side light transmitting member. Thus, the combination of Yamagishi and Asano neither teach nor suggest all the features of the claimed invention. Accordingly, Applicant requests the withdrawal of the rejection of claim 8.

Claims 1 and 3-5 are provisionally rejected under judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1 and 2 of co-pending Application No. 09/772994. Applicant submits as amended, claim 1, upon which claims 3-5 depend, recite subject matter that is distinct from claims 1 and 2 of the co-pending application.

Specifically, claims 1 and 2 of the co-pending application do not teach or suggest a solar cell element having a semiconductor junction formed with a p-type or n-type crystalline silicon substrate and n-type or p-type semiconductor layer, and the solar cell element positioning the semiconductor junction at the crystalline silicon substrate on an opposite side of the front surface side light transmitting member. Also, claims 1 and 2 of the co-pending application neither teach nor suggest a crystalline silicon substrate as claimed in the present invention. Thus, these features are neither taught nor suggested in the recited claims of the present application. In contrast, claim 1 and 2 recite a water transmission preventing layer arranged in a position including at least an interval part between the solar cell elements adjacent to each other. Therefore, it is respectfully submitted that claims 1 and 3-5 are not obvious in view of claims 1 and 2 of the co-pending application. Accordingly, Applicants request the withdrawal of the double patenting rejection of claims 1 and 3-5.

In view of the distinctions discussed above, withdrawal of the rejections to claims 1-8 is respectfully requested. Figures 3 and 4 have been amended with a request for the approval of drawing correction being submitted with this amendment. The specification has also been amended to overcome informalities. Furthermore, claims 1, 2, 6 and 8 have been amended and no new matter is added. Also, Applicant respectfully submit that the

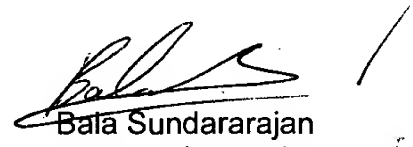
claimed invention as recited in claims 1-8 recite subject matter that is neither taught nor suggested by the applied prior art. Therefore, Applicant submits that the application is now in condition for allowance with Claims 1-8 contained therein.

Should the Examiner believe the application is not in condition for allowance, the Examiner is invited to contact Applicant's undersigned attorney at the telephone number listed below.

In the event this paper is not considered to be timely filed, Applicant's respectfully petition for an appropriate extension of time. The Commissioner is authorized to charge payment for any additional fees which may be required with respect to this paper to Counsel's Deposit Account 01-2300.

Respectfully submitted,

Arent Fox Kintner Plotkin & Kahn



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Enclosures: Marked-Up Copy of Specification and Claims
Translation of Japanese Priority Document 2000-42638

MARKED-UP COPY OF SPECIFICATION AND CLAIMS

IN THE SPECIFICATION:

Page 1, line 6:

This invention relates to a solar cell module, particularly [relates] to a two-side incidence type solar cell module provided with transparent front and rear surface members capable of entering light from both front and rear surfaces.

Page 1, lines 12-13:

Because solar light is unexhausted energy, a solar cell device for directly converting light energy into electrical energy has been developed as energy source [for substituting with] to substitute for environmentally harmful fossil fuel such as petroleum and coal. A plurality of solar cell elements are electrically connected in series or in parallel with each other to form a solar cell module and increase an output. The solar cell module can be used as a practical energy source.

Page 1, line 16:

Because solar light is unexhausted energy, a solar cell device for directly converting light energy into electrical energy has been developed as energy source for substituting with environmentally harmful fossil fuel such as petroleum and coal. A plurality of solar cell elements are electrically connected in series or in parallel with each other to form a solar cell module and increase [an] their output. The solar cell module can be used as a practical energy source.

Page 2, line 14:

The solar cell element 110 is so structured that n-type impurities are diffused on a p-type single crystalline silicon substrate 110a to form an n-type semiconductor layer 110b so that a semiconductor junction is formed. The rear surface electrode 110d of aluminum (Al) is formed on a rear surface side of the substrate 110a. The aluminum of the rear surface electrode 110d is diffused and a p+-type diffusion layer 110c is formed on the rear surface side of the substrate 110a. A comb-shaped electrode 110e of silver (Ag) is formed on a front surface side of the substrate and a silicon dioxide (SiO_2) layer as a reflection

preventing layer 110f is formed.

Page 2, line 22:

A conventional solar cell module has a structure with a semiconductor junction arranged on a light incidence side of a front surface glass on as shown in Fig. 4 so that many carriers are generated on the light incidence side and a strong electric field on the junction separates the carriers.

Page 3, line 1:

A solar cell element capable of [entering] receiving light from both the front and the rear surfaces with a structure that the electrode [provided] provides on the front and rear surface side [not only on the front surface side] is formed of a transparent material [has been proposed in order to efficiently utilize] that facilitates the utilization of light.

Page 3, lines 8-9:

In the meantime, a solar cell module should be weather proof in order to withstand long-term use in outside. When a lamination film such as the rear surface member 101 [which]in which the metal foil is sandwiched with plastic films, water entrance from outside is suppressed and high power generation performance can be obtained for a long period of time.

Page 3, line 13:

The above solar cell element of the two-side incidence type uses [for the] a rear surface member formed of transparent material. However, when a transparent resin film is used as the rear surface member, water is likely to enter as compared with a lamination film with a metal foil sandwiched with plastic films.

Page 4, line 5:

A solar cell module of this invention comprises a front surface side light transmitting member containing at least sodium, a rear surface member, and a solar cell element sealed with sealing resin between the front surface side light transmitting member and the

rear surface member. The solar cell element has a semiconductor junction positioned on an opposite side of the front surface side light transmitting member.

Page 4, lines 18 & 21:

With the above structure, the alkaline component such as the sodium ions are shielded by a thick bulk semiconductor, and effects to a junction part which [is] are important in forming an electric filed can be substantially eliminated. Therefore, degradation of power generation performance of the solar cell element 3 can be substantially eliminated. As a result, a highly reliable solar cell module capable of withstanding long-term use [in] outside can be provided.

Page 6, line 10:

A quantity of sodium in 1g of the resin for sealing the solar cells of the solar cell module using the lamination film is 0.3μg/g, and that of the solar cell module using only the PVF film is 3μg/g. The quantity of sodium relates to [the change rate] changes in the rate of output, and as the quantity of sodium in the resin increases, the power generation performance degrades.

Page 7, line 14:

This invention was made to improve reliability by not having alkaline composition such as the sodium deposited from the front surface glass affect [to] the semiconductor junction of a solar cell element.

Page 7, line 25 - Page 8, line 3:

The solar cell module according to the embodiment of this invention generates power at both front and rear surfaces, and has a structure that, as shown in Fig. 1, a plurality of solar cell elements 3 is sealed with transparent and insulative resin 4 such as EVA (ethylene vinyl acetate) between a front surface glass 1 and a rear surface member 2. The rear surface member 2 is a transparent plastic film of PVF or the like so that light can [be entered] enter from the rear surface. In Fig. 1, a single unit of the solar cell element 3 is shown. The solar cell elements are connected with each other in series or in parallel by a

connection lead such as a copper foil.

Page 9, line 8:

The solar cell elements are sandwiched with an EVA resin sheet 4 so as to locate semiconductor junction of the solar cell element 3 between the front surface glass 1 and the rear surface member 2 on an opposite side of the front surface glass 1 and is heated under a reduced pressure so that the module is integrally formed.

Page 9, lines 22-23:

As shown in Fig. 1, the plurality of the solar cell elements 3 are sealed with the EVA resin 4 between the front surface glass 1 and the rear surface member 2, where the semiconductor junction is positioned on an opposite side of the front surface glass 1.

Page 10, line 21:

The sample of the invention includes a transparent plastic film of PVF (polyvinyl fluoride) so as to enter light from the rear surface. The conventional example includes a lamination film of a metal (Al) foil as the rear surface member sandwiched with plastic films of PVF. The conventional example and the sample of the invention [has] have the same structure except that the material of the rear surface member is different, and the semiconductor junction is positioned on a side of the glass substrate or on an opposite side of the glass substrate.

Page 11, lines 12-15:

Explanation on the second embodiment of the invention is made by referring to Fig. 2. As shown in Fig. 2, this embodiment uses the solar cell element 5 capable of entering light from both front and rear surfaces and having a structure [(an HIT structure)] (a High Throughput) which a substantially intrinsic amorphous silicon is sandwiched between the single crystalline silicon substrate and the amorphous silicon layer so that [defective] defects on the interface [is] are reduced and characteristics of the hetero junction interface [is] are improved.

Page 11, line 20 to Page 12, line 11:

As shown in Fig. 2, the solar cell element 1 includes an n-type single crystalline silicon substrate 51, an intrinsic amorphous silicon layer 52, and a p-type amorphous silicon layer 53 formed in this order. A transparent electrode 54 on a light receiving side formed of ITO or the like is formed on an entire surface of the p-type amorphous silicon layer 53, and a comb-shaped collector 55 of silver (Ag) or the like is formed on the transparent electrode 54 on a light receiving side. An opposite surface of the substrate 51 has a BSF (Back Surface Field) structure which introduces an internal electric field on the rear surface of the substrate; a high dope n-type amorphous silicon layer 57 is formed with an intrinsic amorphous silicon layer 56 interposed on an opposite surface side of the substrate 51. A transparent electrode 58 on a rear surface side of ITO (Iridium Tin Oxide) or the like is formed on an entire surface of the high dope n-type amorphous silicon layer 57, and a comb-shaped collector 59 of silver (Ag) or the like is formed thereon. The rear surface also has a BSF structure which the intrinsic amorphous silicon layer is sandwiched between the crystalline silicon substrate and the high dope amorphous silicon layer in order to reduce defective on the interface and improve characteristics of the hetero junction interface.

Page 12, lines 14-15:

A plurality of the solar cell elements 5 are connected in series with connection members (not shown). The solar cell elements 5 are arranged so as to position the semiconductor junction on an opposite side of the front surface glass 1; that is a comb-shaped collector 59 on a side corresponding a side on the rear surface is positioned on the side of the glass substrate 1, and a p-type amorphous silicon layer 53 for forming semiconductor junction on the side of the rear surface film 2 is positioned.

Page 12, lines 19-20:

A plurality of the solar cell elements 5 are connected in series with connection member (not shown). The solar cell elements are arranged so as to position semiconductor junction on an opposite side of the front surface glass 1; that is a comb-shaped collector 59 on a side corresponding a side on the rear surface is positioned on

the side of the glass substrate 1, and a p-type amorphous silicon layer 53 for forming a semiconductor junction is positioned on the side of the rear surface film 2 [is positioned].

IN THE CLAIMS

1. (Amended) A solar cell module comprising:

a front surface side light transmitting member containing at least sodium[,];

a rear surface member[, and] ;

a solar cell element sealed with a sealing resin between the front surface side light transmitting member and the rear surface member,

wherein the solar cell element has a semiconductor junction formed with a p-type or n-type crystalline silicon substrate and n-type or p-type semiconductor layer, and the solar cell element has the semiconductor junction positioned at the crystalline silicon substrate on an opposite side of the front surface side light transmitting member.

2. (Amended) The solar cell module according to claim 1,

wherein the solar cell element is [so structure] structured so that light enters from a side opposite of the semiconductor junction.

6. (Amended) The solar cell module according to claim 1,

wherein the solar cell element is a single crystalline silicon solar cell element formed by diffusing impurities in the p-type or n-type crystalline silicon substrate with heat diffusion [a heat diffusing type single crystalline silicon solar cell element].

8. (Amended) The solar cell module according to claim 1,

wherein the solar cell element includes a heterojunction between a crystalline semiconductor and an amorphous semiconductor.